

IN THE CLAIMS

Please amend the claims as follows:

1. (original) In a tube fitting of the type including a fitting body having a cylindrical bore for receiving a tube end and including a tapered mouth at one end of said bore; a drive member having a threaded engagement with said body and having a ferrule drive surface; a first ferrule having a tapered first end that extends into said tapered mouth of the fitting body and having a second end with a tapered recess that axially extends toward said first end; and a second ferrule having a substantially continuous cylindrical interior wall that closely surrounds the tube end, a tapered nose portion that extends into said tapered recess of said first ferrule, and a driven surface on a back end thereof that engages said ferrule drive surface; the improvement wherein said second ferrule is case hardened about its entire surface, said second ferrule has a rear portion of said cylindrical interior wall that is radially spaced from the tube end upon pull-up of the fitting, a forward edge of said tapered nose portion that penetrates an outer surface of the tube end, and a collet portion of said substantially continuous cylindrical interior wall that is axially behind said forward edge and that upon pull-up of the fitting is deformed radially against said outer surface of the tube end to collet the tube end.
2. (original) The fitting of claim 1 wherein said second ferrule is deformed during pull-up of the fitting by a toggle-like hinging action.
3. (original) The fitting of claim 2 wherein said toggle-like hinging action results from said rear portion moving radially outward from said outer surface of the tube end about a region of said second ferrule that joins said rear portion to said collet portion.
4. (original) The fitting of claim 3 wherein said toggle-like hinging action causes said collet portion to be radially compressed against said outer surface of the tube end with a high gripping pressure upon pull-up of the fitting.

5. (original) The fitting of claim 3 wherein said drive member ferrule drive surface initially contacts said second ferrule driven surface at a location radially outward to at least a central portion of said second ferrule driven surface.
6. (original) The fitting of claim 1 wherein said driven surface is convex.
7. (original) The fitting of claim 1 wherein said second ferrule interior cylindrical wall comprises a circumferential recess between said forward edge and said back end.
8. (original) The fitting of claim 1 wherein said second ferrule comprises metal.
9. (original) The fitting of claim 8 wherein said metal comprises stainless steel.
10. (original) In a tube fitting of the type including a fitting body having a cylindrical bore for receiving a tube end and including a tapered mouth at one end of said bore; a drive member having a threaded engagement with said body and having a ferrule drive surface; a first ferrule having a tapered first end that extends into said tapered mouth of the fitting body and having a second end with a tapered recess that axially extends toward said first end; and a second ferrule having a substantially continuous cylindrical interior wall that closely surrounds the tube end, a tapered nose portion that extends into said tapered recess of said first ferrule, and a driven surface on a back end thereof that engages said ferrule drive surface; the improvement wherein said second ferrule has a rear portion of said cylindrical interior wall that is radially spaced from the tube end upon pull-up of the fitting, a forward edge of said tapered nose portion that penetrates an outer surface of the tube end, and a collet portion of said substantially continuous cylindrical interior wall that is axially behind said forward edge and that upon pull-up of the fitting is deformed by a toggle-like hinging action that results from said rear portion moving radially outward from said outer surface of the tube end about a region of said second ferrule that joins said rear portion to said collet portion.

11. (original) The tube fitting of claim 10 wherein said collet portion is radially compressed against said outer surface of the tube end to collet the tube end with a high radial gripping pressure.

12. (original) The tube fitting of claim 10 wherein said second ferrule is case hardened about its entire surface.

13. (original) The fitting of claim 10 wherein said drive member ferrule drive surface initially contacts said second ferrule driven surface at a location radially outward to at least a central portion of said second ferrule driven surface.

14. (original) The fitting of claim 10 wherein said second ferrule comprises metal.

15. (original) The fitting of claim 10 wherein said metal comprises stainless steel.

16. (original) In a tube fitting of the type including a fitting body having a cylindrical bore for receiving a tube end and including a tapered mouth at one end of said bore; a drive member having a threaded engagement with said body and having a ferrule drive surface; a first ferrule having a tapered first end that extends into said tapered mouth of the fitting body and having a second end with a tapered recess that axially extends toward said first end; and a second ferrule having a substantially continuous cylindrical interior wall that closely surrounds the tube end, a tapered nose portion that extends into said tapered recess of said first ferrule, and a driven surface on a back end thereof that engages said ferrule drive surface; the improvement wherein said second ferrule driven surface has a generally convex contour, a forward edge of said tapered nose portion that penetrates an outer surface of the tube end, and a portion of said substantially continuous cylindrical interior wall that is radially compressed by a toggle-like hinging action to collet the tube end near said forward edge.

17. (original) The tube fitting of claim 16 wherein said second ferrule is case hardened over its entire surface.

18. (original) The tube fitting of claim 16 wherein said second ferrule has a rear portion of said cylindrical interior wall that is radially spaced from the tube end upon pull-up of the fitting.
19. (original) The fitting of claim 16 wherein said second ferrule comprises metal.
20. (original) The fitting of claim 16 wherein said metal comprises stainless steel.
21. (original) In a tube fitting of the type including a fitting body having a cylindrical bore for receiving a tube end and including a tapered mouth at one end of said bore; a drive member having a threaded engagement with said body and having a ferrule drive surface; a first ferrule having a tapered first end that extends into said tapered mouth of the fitting body and having a second end with a tapered recess that axially extends toward said first end; and a second ferrule having a substantially continuous cylindrical interior wall that closely surrounds the tube end, a tapered nose portion that extends into said tapered recess of said first ferrule, and a driven surface on a back end thereof that engages said ferrule drive surface; the improvement wherein said second ferrule driven surface has a generally convex contour, a forward edge of said tapered nose portion that penetrates an outer surface of the tube end, a portion of said substantially continuous cylindrical interior wall that is radially compressed to collet the tube end near said forward edge, and a rear portion of said cylindrical interior wall that is radially spaced from the tube end upon pull-up of the fitting.
22. (original) The tube fitting of claim 21 wherein said second ferrule is case hardened over its entire surface.
23. (original) The fitting of claim 21 wherein said second ferrule is deformed during pull-up of the fitting by a toggle-like hinging action.
24. (original) The fitting of claim 23 wherein said toggle-like hinging action results from said rear portion moving radially outward from said outer surface of the tube end about a region of said second ferrule that joins said rear portion to said collet portion.

25. (original) The tube fitting of claim 24 wherein said second ferrule is case hardened over its entire surface.

26. (original) The fitting of claim 21 wherein said drive member ferrule drive surface initially contacts said second ferrule driven surface at a location radially outward to at least a central portion of said second ferrule driven surface.

27. (original) The fitting of claim 21 wherein said second ferrule interior cylindrical wall comprises a circumferential recess between said forward edge and said back end.

28. (original) The fitting of claim 21 wherein said second ferrule comprises metal.

29. (original) The fitting of claim 21 wherein said metal comprises stainless steel.

30. (original) A tube fitting comprising: a fitting body having a cylindrical bore for receiving a tube end and including a tapered mouth at one end of said bore; a drive member having a threaded engagement with said body and having a ferrule drive surface; a first ferrule having a tapered first end that extends into said tapered mouth of the fitting body and having a second end with a tapered recess that axially extends toward said first end; and a second ferrule having a generally cylindrical interior wall, a tapered first end that extends into said tapered recess of said first ferrule, a tapered outer wall portion, and a driven surface on a second end thereof that engages said drive member ferrule drive surface; said second ferrule interior wall having a first circumferential recess located between said first and second ends of said second ferrule; said tapered wall portion having a second circumferential recess near said first end; said recesses reducing force concentrations on said drive member drive surface when the fitting is pulled up.

31. (new) A method for sealing and gripping a tube end using a tube fitting of the type having a fitting body and nut that are joinable and enclose a tube end, a first ferrule and a second ferrule

wherein the second ferrule has a forward portion that engages the first ferrule and a rearward portion that is driven by the nut when the fitting is pulled up, the method comprising the steps of:

deforming the second ferrule during pull-up of the fitting so as to cause a back end thereof to be radially spaced from the tube end upon pull-up;

deforming the second ferrule during pull-up so as to cause a front edge thereof to indent into the tube end; and

deforming the second ferrule during pull-up with a toggle-like hinging action so that a collet portion thereof is radially compressed against the tube end.

32. (new) The method of claim 1 wherein said collet portion is axially behind said indented front edge to isolate said indented front edge from vibration.

33. (new) The method of claim 1 comprising the step of case hardening the second ferrule over its entire surface prior to assembly into the fitting.

34. (new) The method of claim 1 comprising the step of forming a circumferential recess in a central bore of the second ferrule prior to assembly into the fitting.

35. (new) The method of claim 1 comprising the step of forming a convex driven surface at said back end of the second ferrule prior to assembly into the fitting.

36. (new) A tube fitting comprising:

a fitting body having a cylindrical bore for receiving a tube end and including a tapered mouth at one end of said bore;

a drive member having a threaded engagement with said body and having a ferrule drive surface;

a first ferrule having a tapered first end that is insertable into said tapered mouth of the fitting body and having a second end with a tapered recess that axially extends toward said first end; and

a second ferrule having a substantially continuous cylindrical interior wall that closely surrounds the tube end when installed thereon, a tapered nose portion that is insertable into said tapered recess of said first ferrule, and a driven surface on a back end thereof that engages said ferrule drive surface during pull-up of the fitting; and

wherein said second ferrule is case hardened about its entire surface, and said second ferrule has a configuration such that upon pull-up of the fitting said second ferrule will deform to cause: 1) a rear portion of said cylindrical interior wall to be radially spaced from the tube end, 2) a forward edge of said tapered nose portion to penetrate an outer surface of the tube end, and 3) a collet portion of said substantially continuous cylindrical interior wall that is axially behind said forward edge to be deformed radially against said outer surface of the tube end to collet the tube end.

37. (new) A tube fitting comprising:

a fitting body having a cylindrical bore for receiving a tube end and including a tapered mouth at one end of said bore;

a drive member having a threaded engagement with said body and having a ferrule drive surface;

a first ferrule having a tapered first end that is insertable into said tapered mouth of the fitting body and having a second end with a tapered recess that axially extends toward said first end; and

a second ferrule having a substantially continuous cylindrical interior wall that closely surrounds the tube end when installed thereon, a tapered nose portion that is insertable into said tapered recess of said first ferrule, and a driven surface on a back end thereof that engages said ferrule drive surface during pull-up of the fitting; and

wherein said second ferrule is case hardened about its entire surface, and said second ferrule has a configuration such that upon pull-up of the fitting said second ferrule will deform with a toggle-like hinging action.

38. (new) The tube fitting of claim 7 wherein during said toggle-like hinging action said second ferrule will plastically deform so that: 1) a rear portion of said cylindrical interior wall will be radially spaced from the tube end, 2) a forward edge of said tapered nose portion will penetrate an outer surface of the tube end, and 3) a collet portion of said substantially continuous cylindrical interior wall that is axially behind said forward edge will be deformed radially against said outer surface of the tube end to collet the tube end.